RystadEnergy

US OCS in focus

A deep-dive into why continuing offshore leasing will continue attracting investments

House Natural Resources Committee
Subcommittee on Energy & Mineral Resources
"Assessing Domestic Offshore Energy Reserves & Ensuring US Energy Dominance"

March 2024

Executive Summary

This report offers a detailed examination of the United States' resources, the significance of the offshore oil and gas sector, encompassing reserves, production trends, exploration activities, and investment prospects.

The United States leads in total hydrocarbon reserves with approximately 596 billion barrels, demonstrating substantial untapped potential, particularly in shale plays and offshore reserves. The nation ranks second in oil and first in gas reserves globally, with significant contributions from both conventional and unconventional sources.

The growth of US oil production, especially since 2010, has played a crucial role in balancing global oil markets. The shale revolution has been the primary driver, with the Permian Basin leading the surge in oil supply. However, deepwater supply has also seen positive additions year-over-year for the past decade. Despite challenges, including deepwater exploration and development, offshore US remains a key contributor to the overall oil and gas supply.

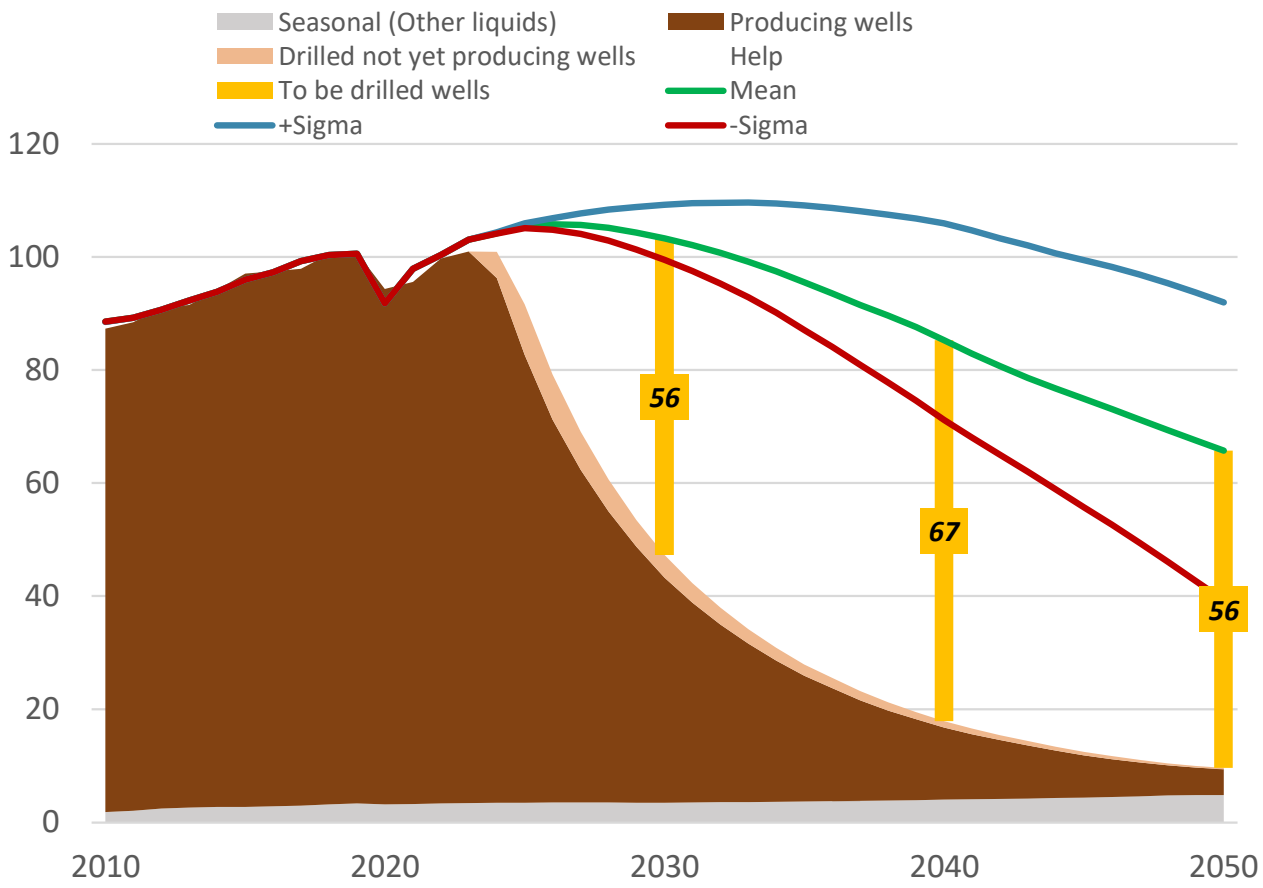
The offshore US presents an attractive investment opportunity for exploration and production companies, characterized by competitive breakeven prices and favourable fiscal terms. The stability and profitability offered by the US fiscal regime make it an appealing destination for global players seeking long-term investment opportunities. The country's offshore sector even comes out on top from an emission intensity standpoint.

While past decades have seen significant offshore discoveries, recent trends indicate a decline in yearly discovered volumes, posing challenges for future production growth. Renewed exploration efforts and timely awards are crucial to unlocking undiscovered potential and sustaining production levels above the 2-2.5 million boe per day mark.

As older vintages contribute a substantial portion of current offshore supply, the future growth trajectory hinges on successful exploration and development activities. Immediate action is needed to address declining discovery trends and ensure the sustained growth of US offshore production.

56 million bpd of oil supply expected to come from new wells in 2030

Global liquids demand vs. supply (Million barrels per day)



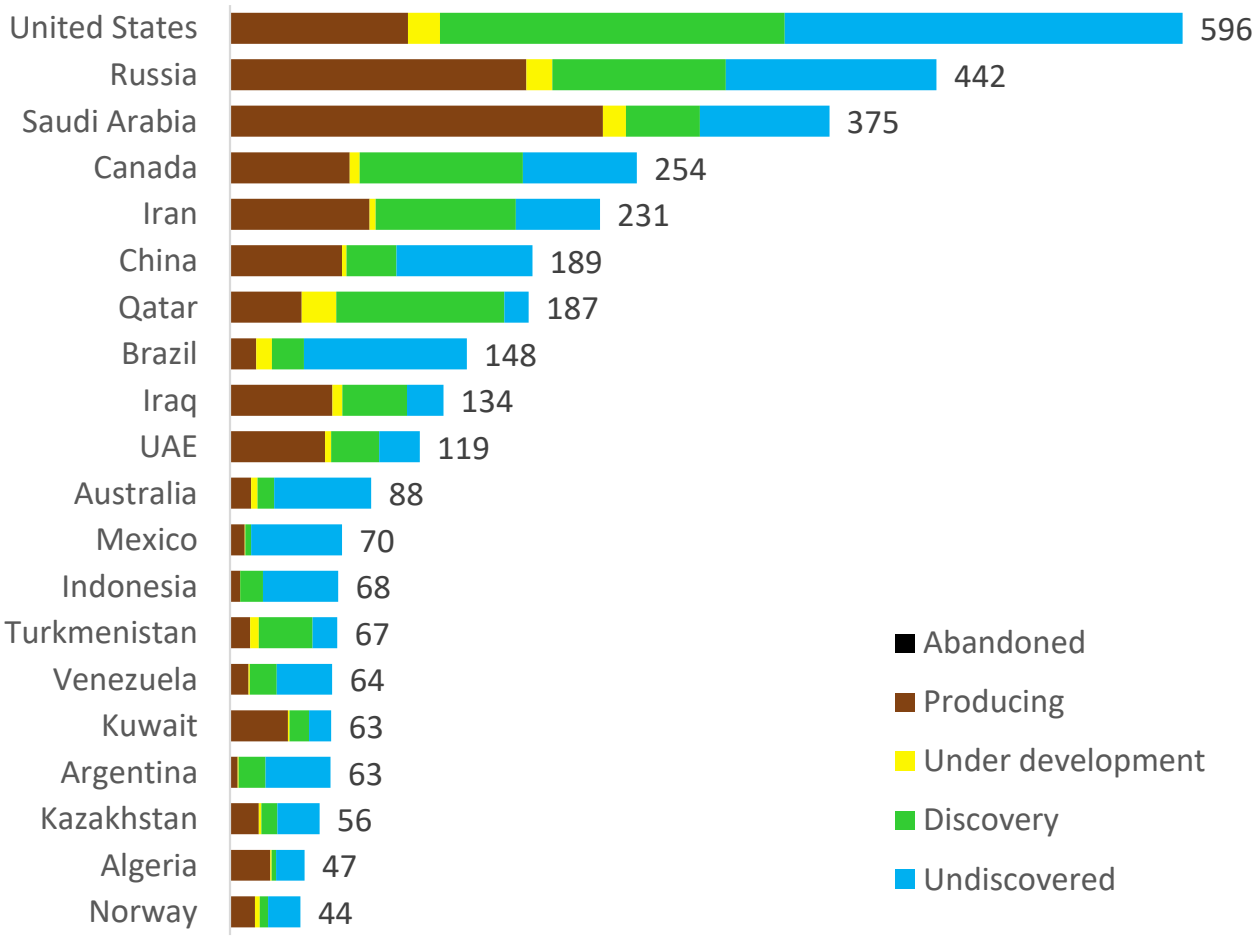
The chart illustrates the global liquids demand scenarios and compares those against the available supply. The three demand scenarios include the Sigma+, the Sigma- and the Mean scenario. Rystad Energy builds its demand scenarios bottoms-up. We make various assumptions when it comes to EV adoption rates, rates for electrification of trucks, plastic recycling, penetration of sustainable aviation fuel, oil displacements in maritime etc. Based on the outcome of these assumptions, we generate demand curves, which correspond to several giga tonnes of emissions. The mean case results into an overall increase of global average temperature rise of 1.9-degrees Celsius by 2100 vs. pre-industrial levels. Similarly, the Sigma+ scenario corresponds to a temperature increase of 2.2-degrees while Sigma- corresponds to a temperature increase of 1.6-degrees.

While compared against supply from currently producing wells, and drilled uncompleted wells, we note that by 2030, we would need around 56 million bpd of supply to be met by wells that have not yet been drilled. These could be shale wells, deepwater wells, wells in OPEC nations etc. Nevertheless, the underpinning message is that the upstream industry would need to continue investing in oil and gas to meet demand.

Source: Rystad Energy UCube March 2024

US holds the highest resource potential in the world

Ranking Top 20 Countries by Technically Recoverable Resources (Billion boe)



The chart provides a comprehensive overview of oil and gas reserves across various countries, distributing them into distinct stages: Abandoned, Producing, Under Development, Discovery, and Undiscovered.

At the forefront is the United States, boasting a total of approximately 596 billion barrels. With nearly 80% of its vast resources still awaiting exploitation, the US remains poised to maintain its position as a dominant global hydrocarbon producer.

In terms of oil and gas, the US ranks second in oil and first in gas reserves. While the nation's renowned shale plays have been instrumental in its ascendancy, significant offshore reserves also contribute substantially. According to Rystad Energy, the US offshore region is estimated to harbour close to 15% of the nation's resources.

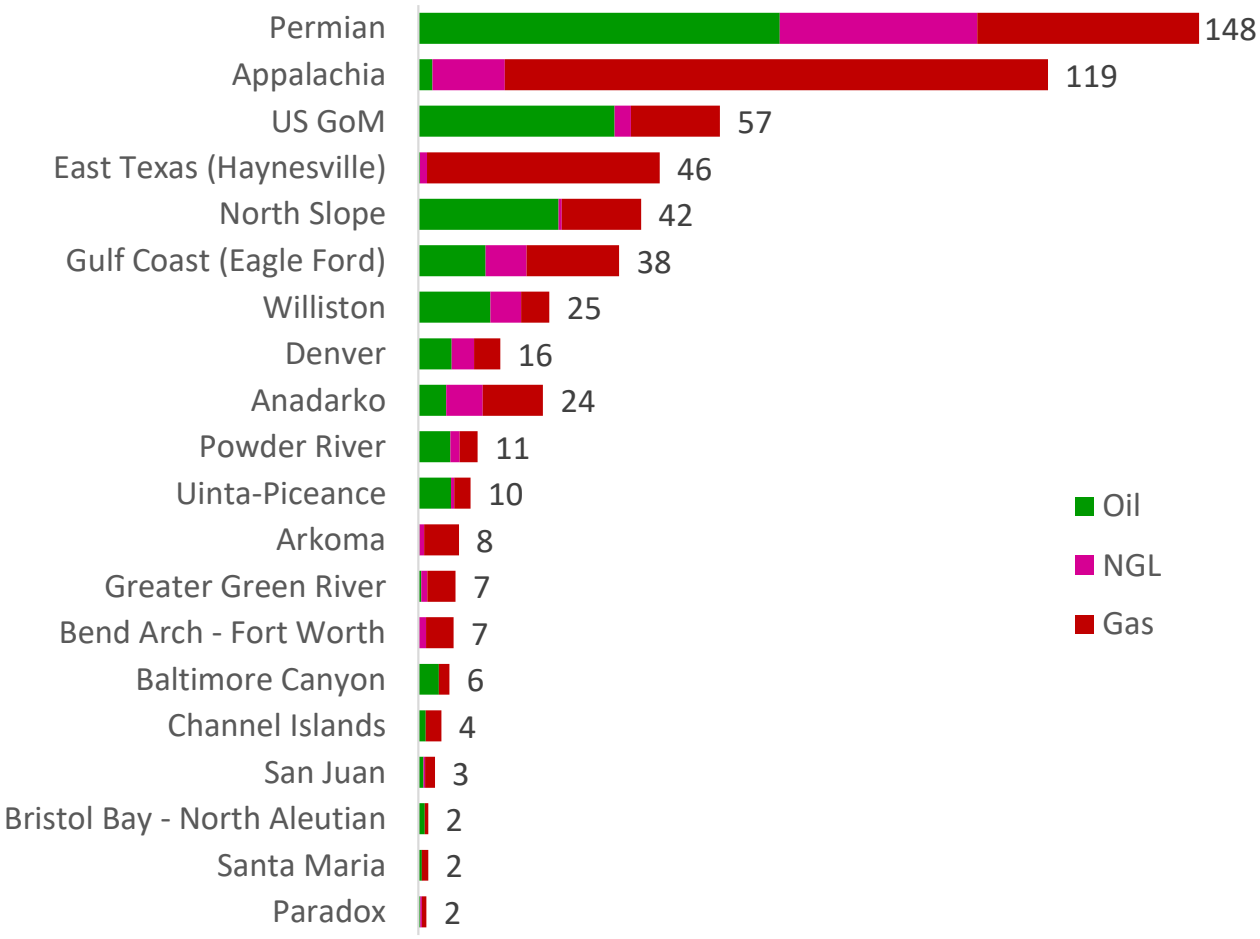
The shale revolution has propelled the US from a net oil importer to a net exporter in recent years. Additionally, the substantial gas volumes in the US are poised to meet a significant portion of global liquefied natural gas (LNG) demand, further underscoring their importance.

Given the geopolitical stability of the US relative to some other countries on the list, these reserves hold significance not only for the nation itself but also for the broader global community.

Source: Rystad Energy UCube March 2024. Note: Total resources may differ while compared against other third-party sources. Rystad performs its own independent analysis wherein well productivity, development timeline, company plans etc., are considered while ascribing resources to fields. Undiscovered volumes could also subject to higher risking.

Gulf of Mexico holds the third highest resource potential in the country

Ranking Top 20 US Basins by Technically Recoverable Resources (Billion boe)



The table presents a comprehensive breakdown of oil, natural gas liquids (NGL), and natural gas resources across various basins in the United States. We have included all lifecycles i.e., producing, under development, discoveries and undiscovered potential.

The Permian leads the list with total resources of 148 billion barrels of oil equivalent (boe). With its vast resources in oil, NGL, and gas, the Permian remains a cornerstone of American energy production, driving the country's oil and gas boom in recent years.

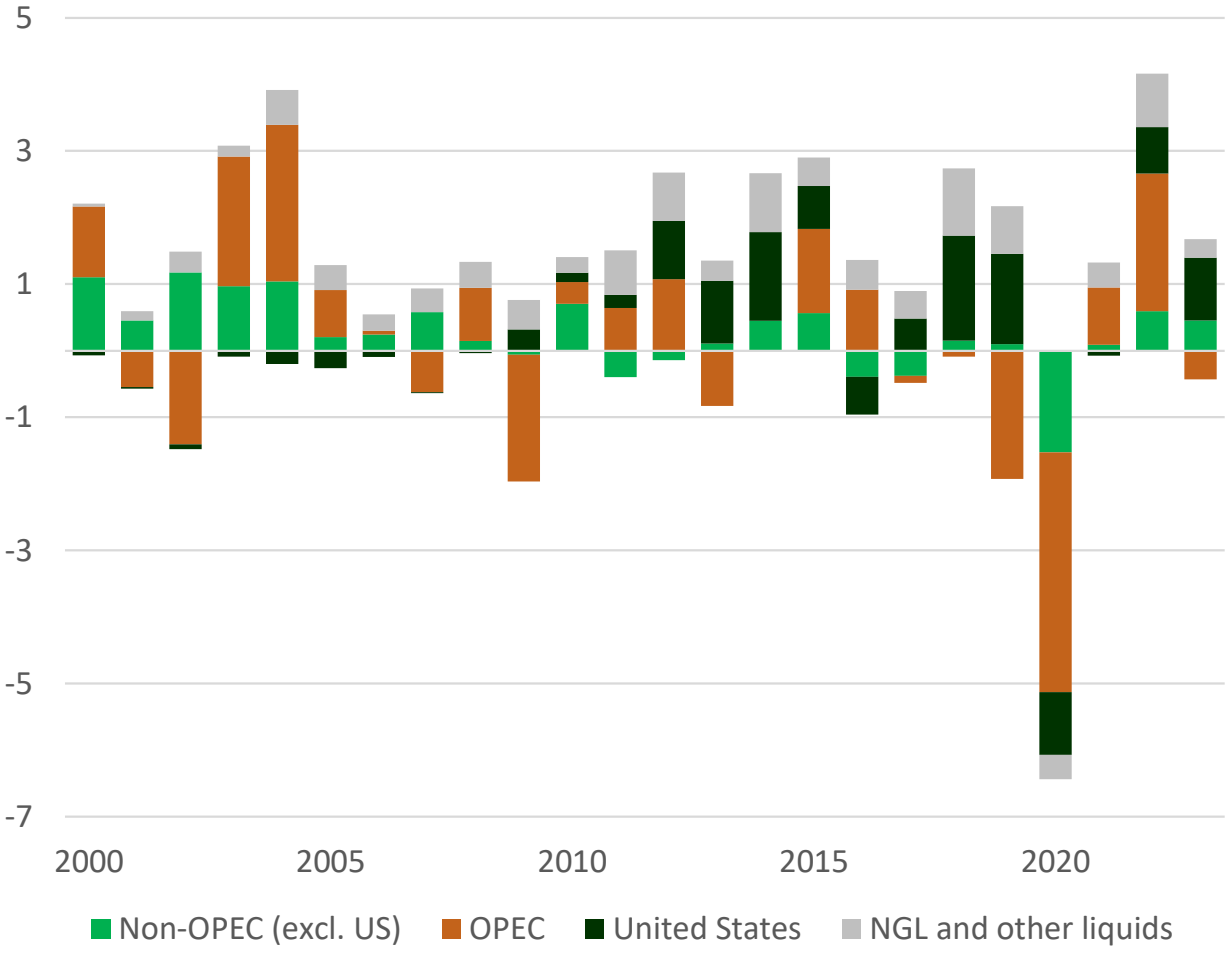
The Appalachia Basin stands out for its substantial natural gas resources, totalling nearly 119 billion boe. Its strategic location and rich gas deposits position it as a vital player in the US natural gas market.

Focusing offshore, the US GoM is a significant contributor to US hydrocarbon resource base, with a total of 57 billion boe. Despite its challenges, including deepwater exploration and production, the GoM remains a key offshore basin for oil and gas development. Outside US GoM, Rystad Energy ranks Alaska OCS, the Atlantic OCS and the Pacific OCS to hold the next highest undiscovered hydrocarbon volumes, of which nearly 60% is expected to be oil.

Source: Rystad Energy UCube March 2024. Note: Total resources may differ while compared against other third-party sources. Rystad performs its own independent analysis wherein well productivity, development timeline, company plans etc., are considered while ascribing resources to fields. Undiscovered volumes could also subject to higher risking.

US has been the main source of supply growth in the past 10 years

YoY change in global liquids supply (Million barrels per day)



To try to understand the importance of US from a global perspective, the chart shows the year-over-year growth in global liquids supply, split by source.

Before 2010, the global oil production – excluding NGL and other liquids – expanded on average by around 770,000 bpd. OPEC accounted for nearly 240,000 bpd of growth in that period while the rest of the world contributed by around 580,000 bpd. US on the other hand, declined by 55,000 bpd year-over-year on average.

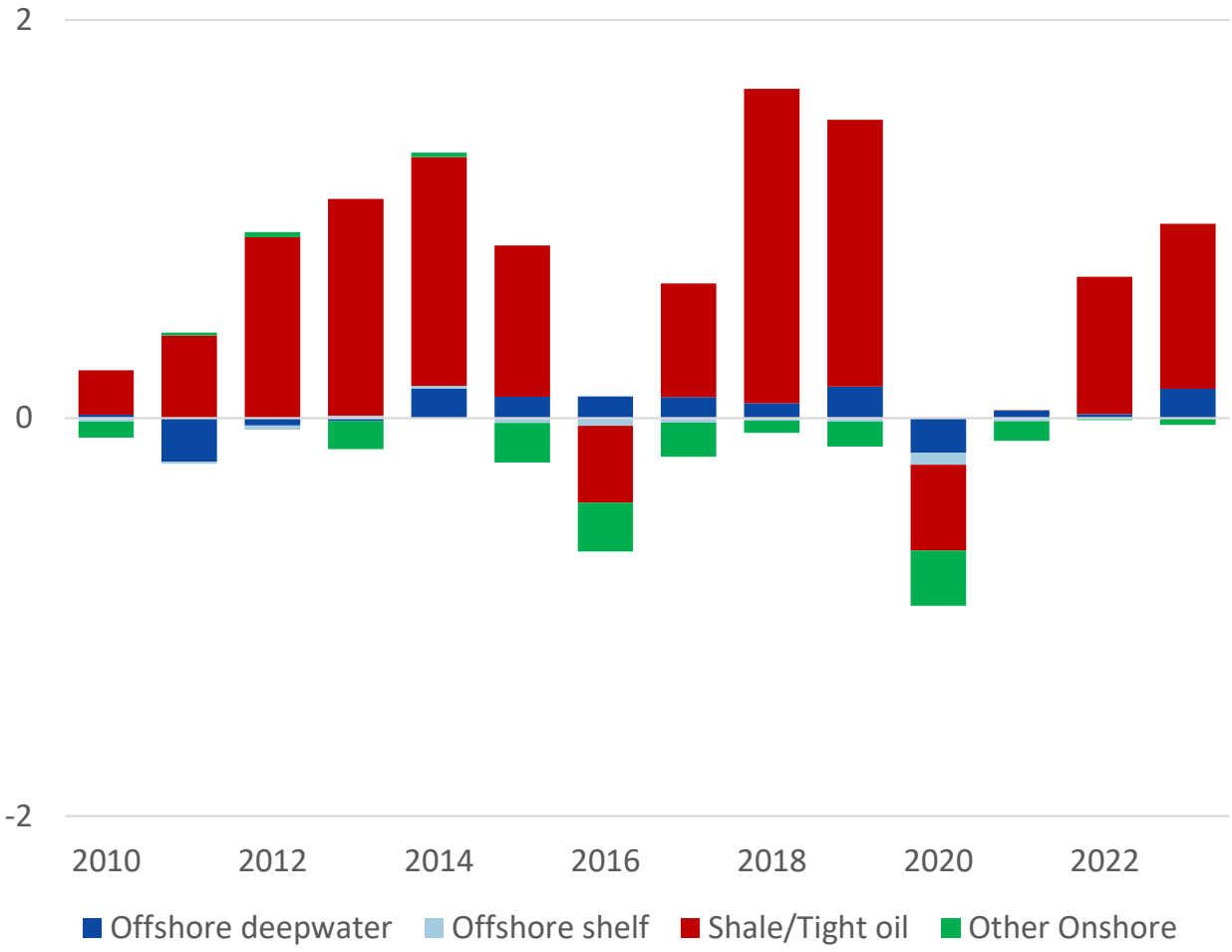
Since 2010, the story has been opposite. From 2010-23, global oil production – excluding NGL and other liquids – expanded on average by around 580,000 bpd. For the same period, US oil volumes grew at an annual rate of 540,000 bpd.

This shows how important the oil from the US has been for the oil market to balance over the last 10 years. Without it, global oil prices would have been considerably higher, as stronger markets would have been needed to incentivize more conventional spending.

Source: Rystad Energy UCube March 2024

Shale has been key but offshore deepwater has been pivotal too

YoY change in US oil supply (Million barrels per day)



Zooming into the US, this chart shows the year-over-year change of US oil supply since 2010. The volumes include crude oil and lease condensate only.

As one would expect, the shale revolution has been the major driver for the overall growth in oil supply. On average, the US shale has grown by around 625,000 bpd in the past 14 years. Within shale, the Permian basin has been the most crucial adding 365,000 bpd on average, followed by Eagle Ford, Williston and Denver basins.

Both conventional onshore and offshore shelf have continued to remain on decline. Offshore shelf declined by 16,500 bpd on average while conventional onshore declined by nearly 100,000 bpd.

Offshore deepwater, on the other hand, has continued growing through the last decade. On average, this supply source grew by around 33,000 bpd since 2010 and by around 73,000 bpd since 2014. Also, since 2014, deepwater US has grown every single year except 2020, which has marred by COVID. Rystad Energy expects US deepwater supply to continue growing over the next 2 years by around 150,000 bpd. However, the growth story can come to a stop if actions to find more volumes are not undertaken.

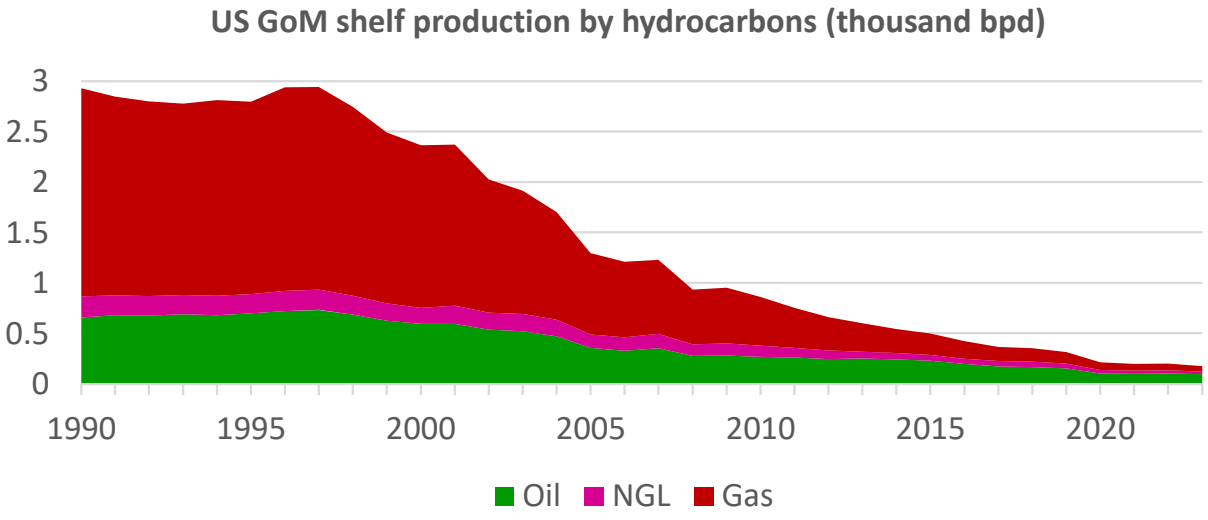
Source: Rystad Energy UCube March 2024

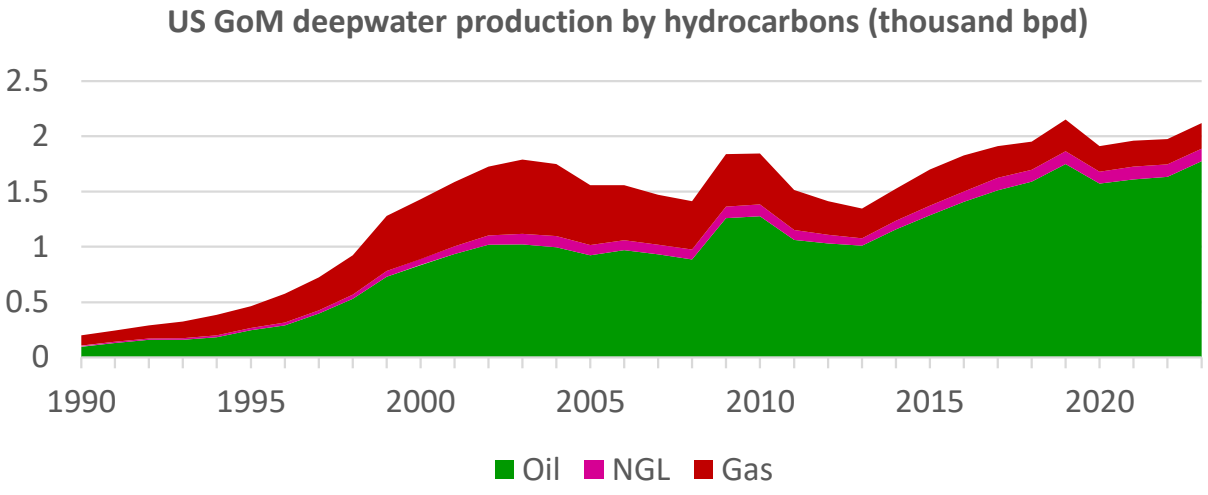
Deepwater production developments help offset the declining shelf supply

The US GoM has cumulatively accounted for nearly 88% of the US offshore hydrocarbon production till date. Volumes from shelf has amounted for over 61% while deepwater volumes have amounted for close to 27%. Currently, over 95% of offshore volumes are produced in the US GoM with deepwater accounting for 92% of that 95% share.

Gas was one of the most prominent hydrocarbon produced offshore while US GoM shelf was on song. However, the weightage has shifted towards oil in the past 20 years with the development growth in deepwater fields. Current oil production stands at 1.96 million bpd with another 145 thousand bpd NGLs. Commercial gas production stands at around 1.85 billion cubic feet per day.

Though production from US GoM has been the main contributor offshore, the region is still touted to hold significant undiscovered potential. Rystad Energy estimates these volumes to be around 38 billion boe.

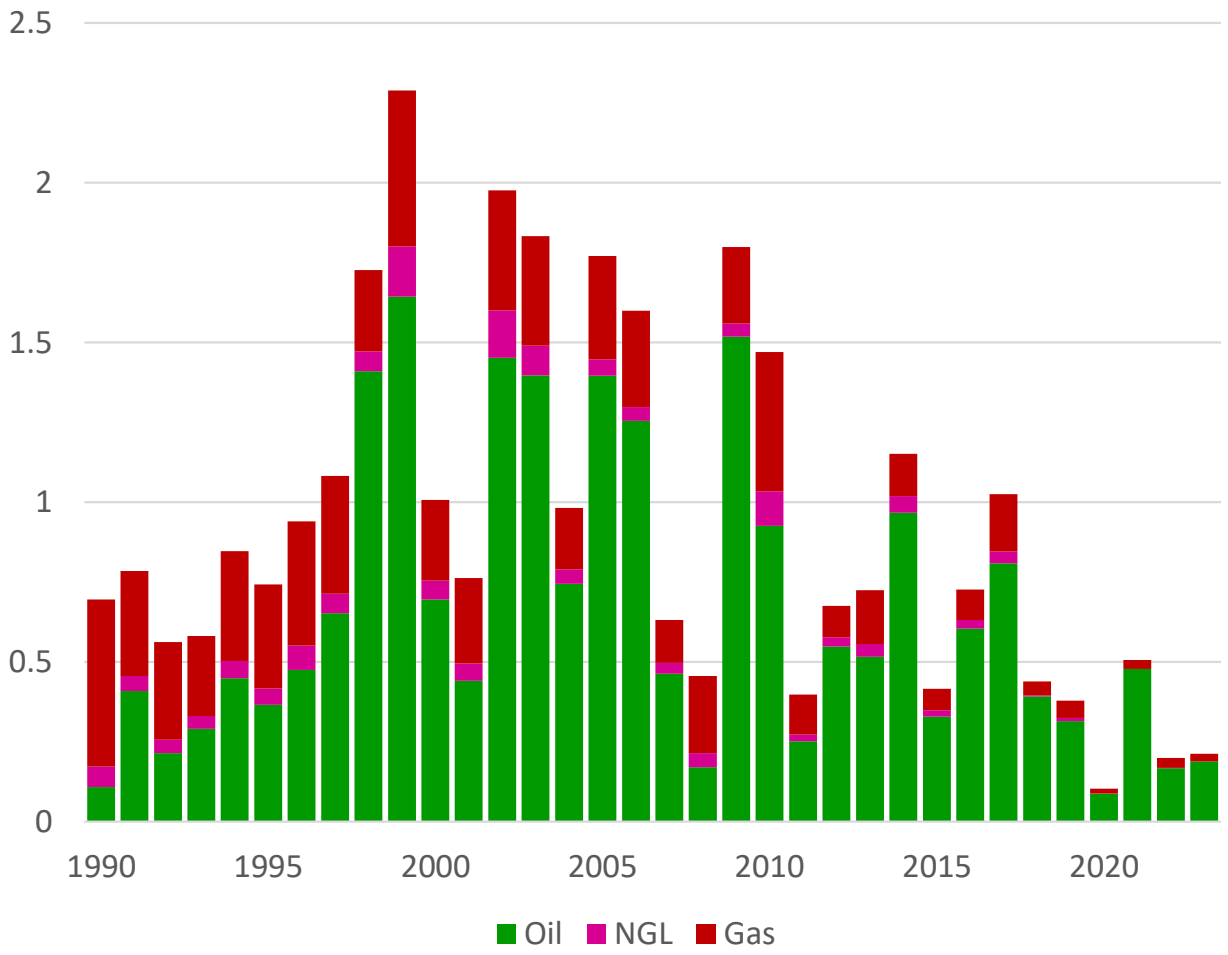




Source: Rystad Energy UCube March 2024

Declining discovered volumes underpins the need for acreage awards

Total Yearly Discovered Resources in offshore US (Billion boe)



Continued success in finding new hydrocarbon resources play a pivotal in sustained supply or even a possible supply growth. The chart above illustrates the yearly discovered volumes offshore US.

Since 1990, Rystad Energy estimates a total of nearly 32 billion boe to have been discovered offshore US. Of the 32 billion boe, companies have already developed nearly 24 billion boe while 2 billion boe are being developed right now.

Between 1990-2000, the yearly average discovered volumes amounted to nearly 1 billion boe each year. These volumes grew significantly to 1.3 billion boe between 2001-10. Since 2010, these discovered volumes have been declining gradually with the overall average being around 500 million boe. Over the past 5 years, the numbers are even more concerning with the average below 300 billion boe.

Since 2017, only a handful of discoveries have been greater than 100 million boe in size. Some of those include Whale, Ballymore , Leopard, Huron, Horn Mountain West, Khaleesi, Blacktip, Mormont etc.

Source: Rystad Energy UCube March 2024

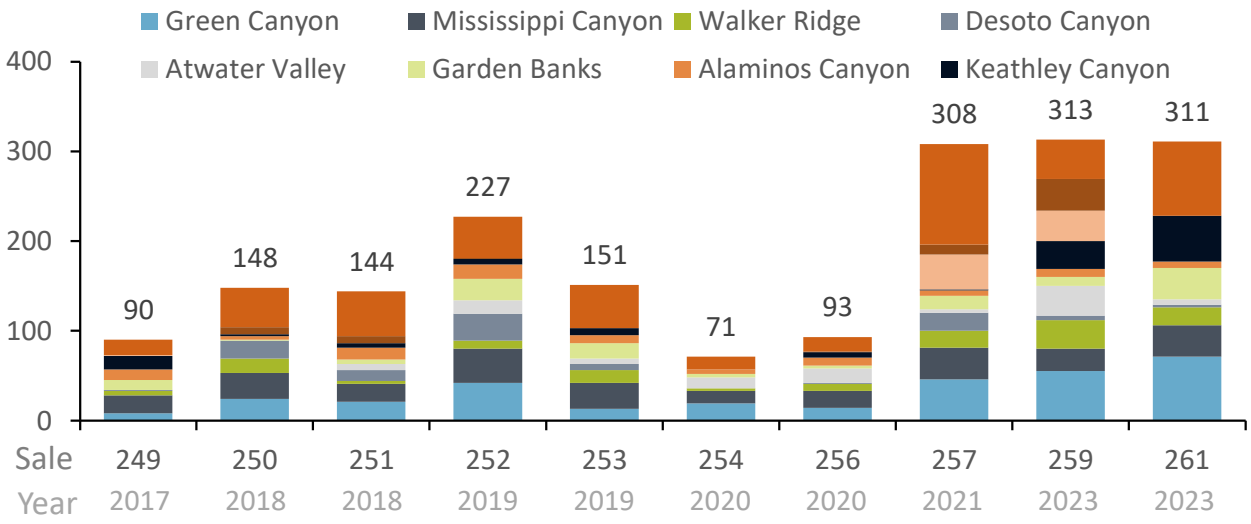
Awards in US Gulf of Mexico continue to attract major global E&Ps

Most recently, the Bureau of Ocean Energy Management (BOEM) held the Lease Sale 259 and Lease Sale 261. Both the lease sale garnered significant attention with over 300 leases awarded in each of them.

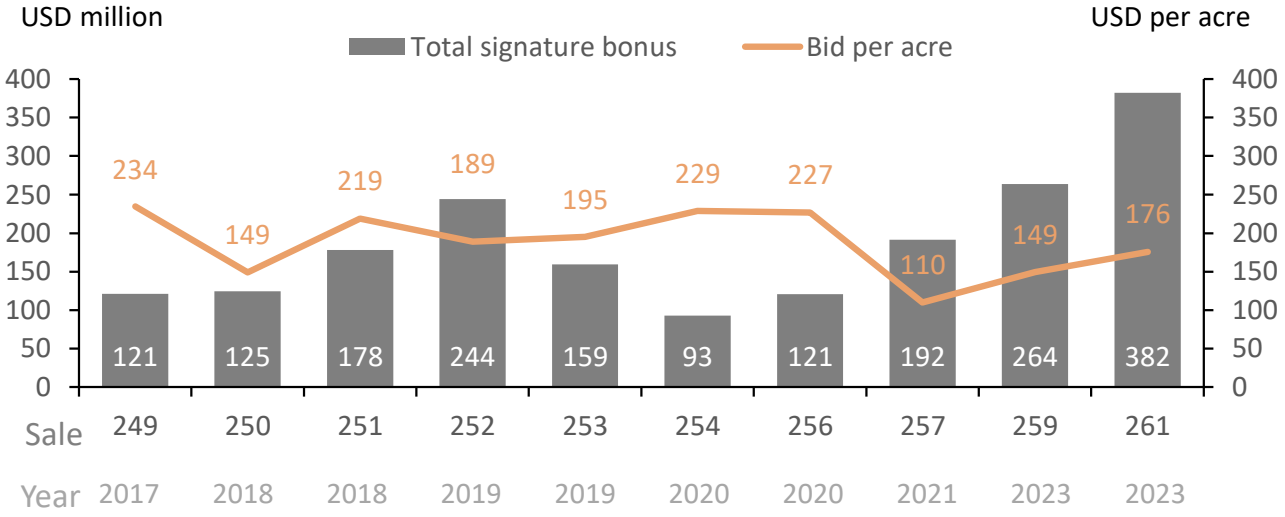
Green Canyon, Keathley Canyon, Mississippi Canyon and Garden Banks were the most sought-after areas in Lease Sale 261 while Lease Sale 259 saw attraction for not just Green Canyon and Keathley Canyon but also for Walker Ridge, Atwater Valley, High Island and Galveston Areas. Additionally, Lease Sale 261 saw $382 million being spent on the 311 tracts awarded, which bettered the record high $264 million spent on the 2017-2022 OCS leasing program.

These sales marked the end of the BOEM's 2017-2022 OCS Oil & Gas Leasing Program and the last at least until 2025.

Number of US Gulf of Mexico leases awarded per lease sale by protraction area



Total signature bonus (LHS) and cost per acre (RHS) per US GoM lease round



Source: Bureau of Ocean Energy Management

US offshore hosts the most diverse player landscape in the world

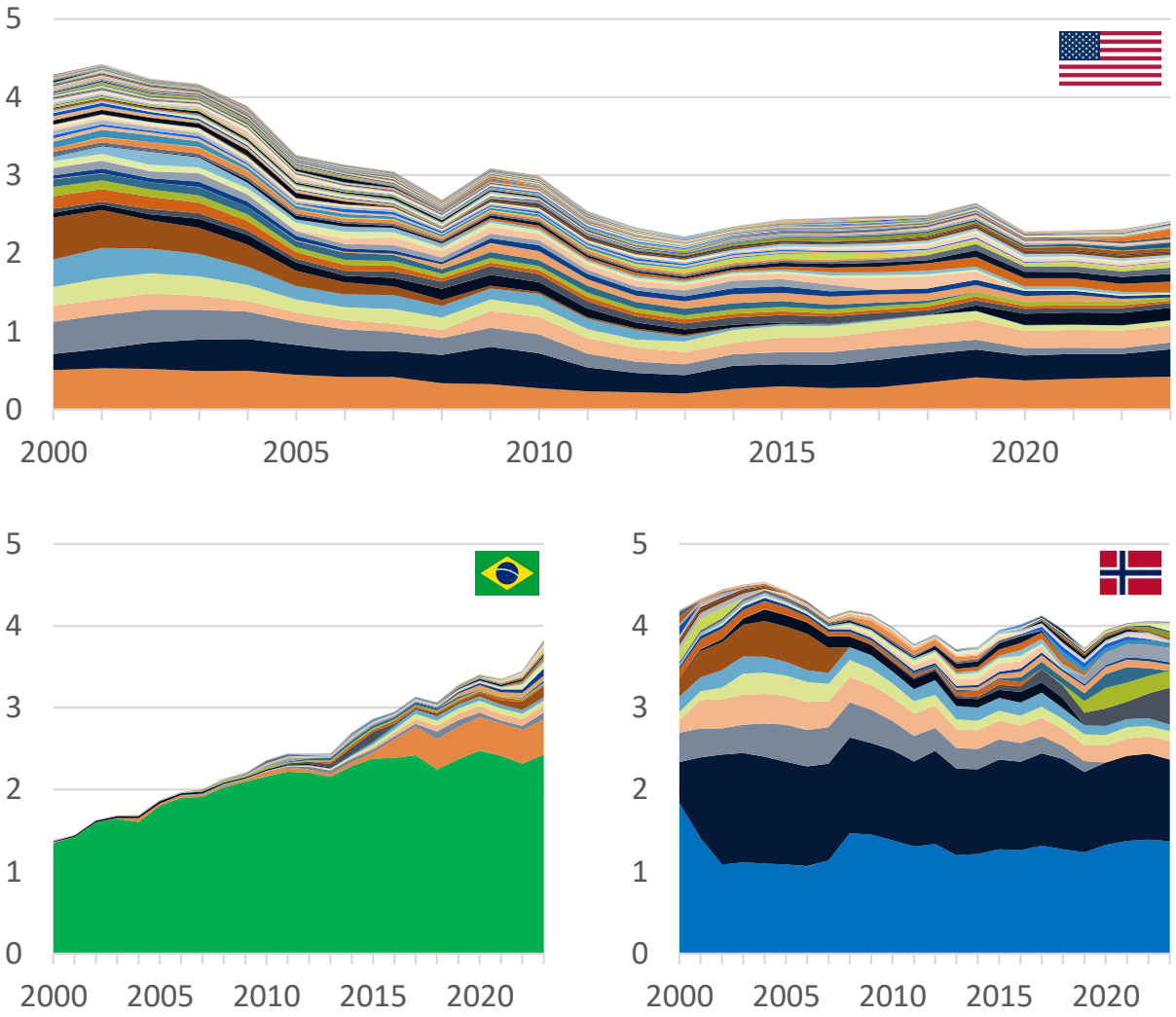
The offshore areas of the US host one of the most diverse landscape for any offshore hydrocarbon producing country. Over 300 companies, privates and publics included, hold participating interest in the several producing tracts and fields.

In comparison, Brazil, which is a deepwater giant, is majorly controlled by their national oil company Petrobras. Similarly, major portion of Norwegian production is controlled by the state owned Equinor and Petoro.

If we further expand the comparison, UK comes out as a comparable from a player count standpoint. Other offshore producers like Angola, Nigeria etc. have their own challenges.

Competitive breakeven, lenient fiscal terms, unparalleled infrastructure, are some factors US offshore one of the most attractive investment arenas for global exploration and production companies.

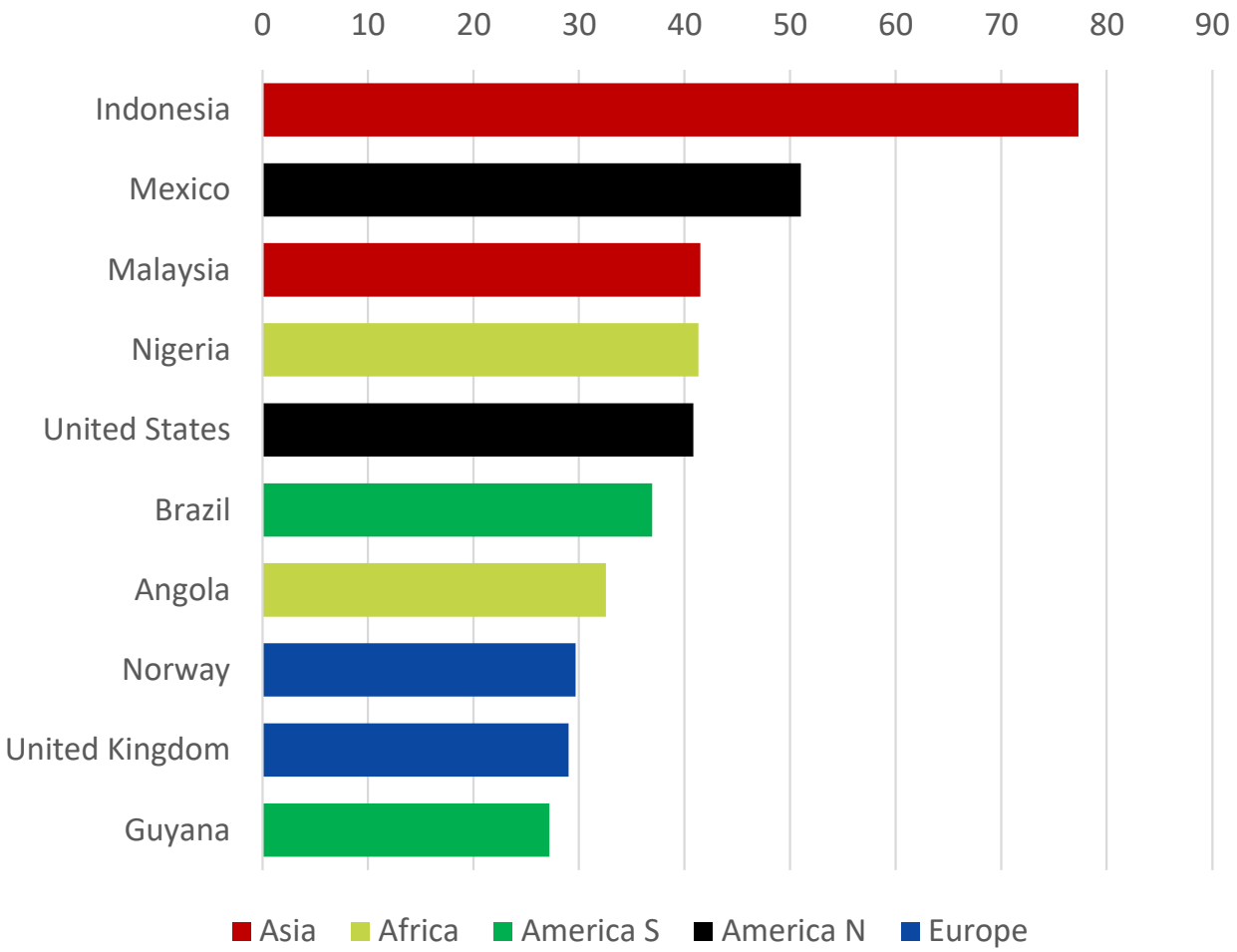
Total production split by company* (Million barrels of oil equivalent per day)



*Legend intentionally hidden as chart's main purpose is to emphasize the diverse player landscape
Source: Rystad Energy UCube March 2024

US offshore developments have been one of the more competitive globally

Average Offshore Breakeven Price* per Country (USD per barrel)



Breakeven prices (BEP) indicate at which oil/gas price an asset is commercial — in other words, the price required for a positive NPV, expressed as the current year (value as of today). Rystad Energy uses a yearly discount rate of 10% (7.5% real) is applied to calculate NPV. We also assume a constant relationship between all hydrocarbon prices.

As indicated in the chart, all oil fields sanctioned in the United States since 2017 have broken even at around $40 per barrel. This has been one of the threshold prices many companies have indicated as a target. Only countries like Brazil, Norway, UK and Guyana have seen better breakeven.

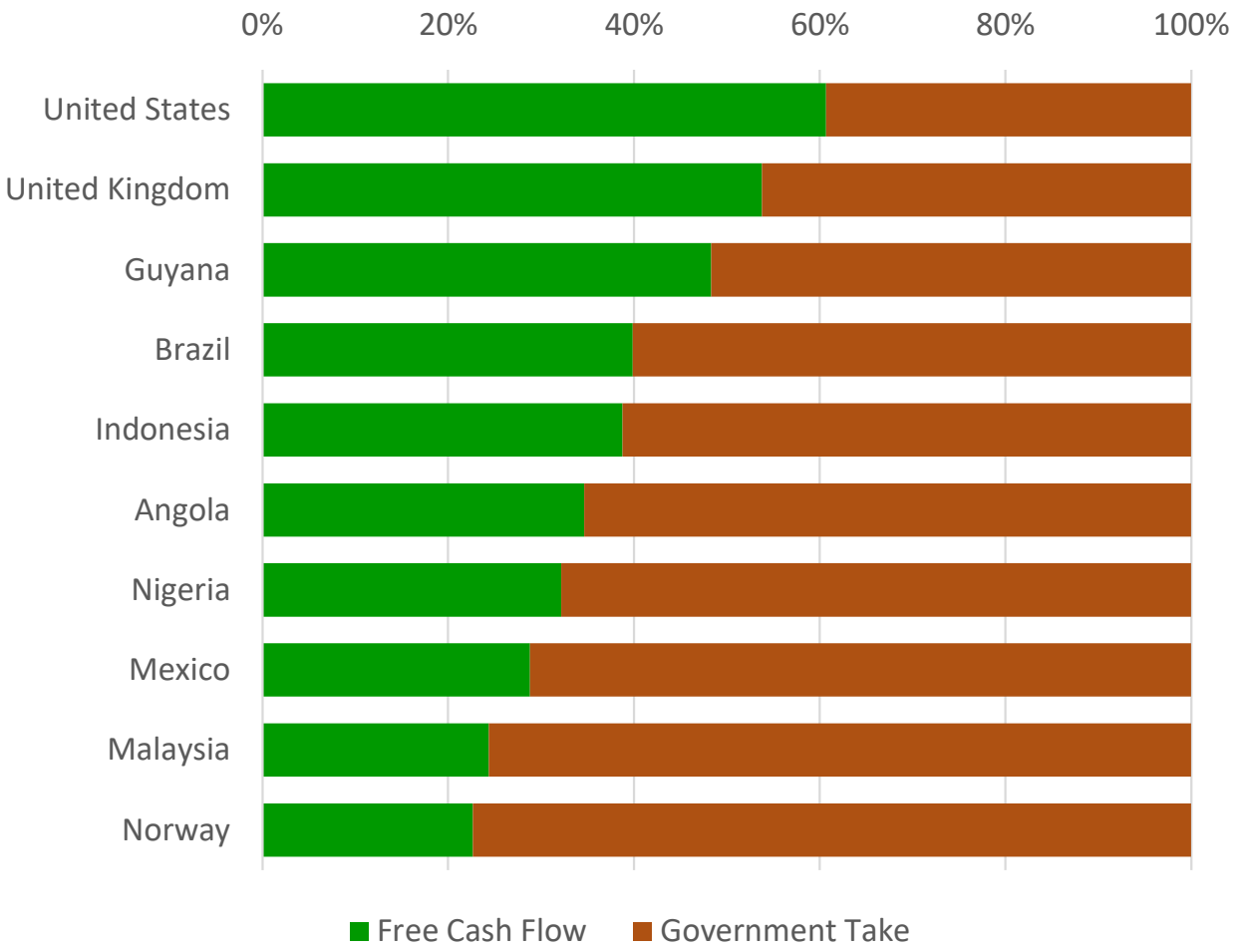
From a total resources sanctioned for the period in consideration stand-point, US is bettered only by Brazil where substantial investments have been diverted towards developing their large presalt oil fields in the Santos basin. From an investment standpoint, only Brazil and Norway have had higher investments approved for development.

These statistics indicate that the offshore US could continue to remain a hotspot for companies focusing offshore. However, it all depends on the health discovered volumes. With countries like Guyana, Namibia, & Suriname, demonstrative higher success rates, Rystad Energy notes the increased competition the offshore space.

*Offshore oil fields sanctioned for development from 2017-23. BEP at the time of discovery.
Source: Rystad Energy UCube March 2024

The US offers one of the most favourable fiscal regime in the world

Average Offshore Government Take per Country (USD per barrel)



This chart illustrates the ratio of present value of government take to the present value of free cashflow. Both these items are as of 1 January 2024 and calculated using a real discount rate of 7.5%. Government take includes all payments to government in the form of royalties, profit oil, federal tax, severance and ad-valorem tax while free cashflow is revenues minus capex, opex and government take.

This is an important parameter to measure while assessing the competitiveness and attractiveness of any country. Resources are important but profitability of investments also plays a significant role for companies while deciding their investment prioritization.

Even though the offshore play of the US is relatively mature, it still offers one of the most favourable fiscal regimes which only consists of royalties and taxes. Also, the stability offered in the US is unparalleled hence aiding the vast player landscape as discussed before.

To quantify, around 60% of the money generated post capex and opex goes to the companies versus 22-25% in countries like Malaysia and Norway. Even emerging oil producers like Guyana and Brazil see around 50-60% of the money go towards the respective governments.

Source: Rystad Energy UCube March 2024

Offshore US is one of the least carbon intensive upstream supply source

Benchmarking upstream emissions and production 2022 by country

Country	CO2 emissions (ktCO2)	Total production (kboe/d)	CO2 intensity (kgCO2/boe)	Extraction (kgCO2/boe)	Flaring (kgCO2/boe)
United States	158,278	34,375	13.0	12.0	1.0
Russia	125,559	21,162	16.3	9.4	6.8
Saudi Arabia	47,605	13,585	9.6	8.7	0.9
Canada	101,530	8,389	33.2	32.3	0.8
Iraq	44,595	4,974	24.6	5.3	19.2
Qatar	17,541	4,359	11.0	10.2	0.9
Norway	9,271	4,055	6.3	5.9	0.3
Brazil	20,685	3,446	16.4	14.5	2.0
Mexico	22,864	2,434	25.7	12.4	13.4
Nigeria	26,540	2,190	33.2	19.3	13.9
United States DW	4,536	1,975	6.3	5.8	0.5
United Kingdom	9,724	1,385	19.2	16.2	3.0

The table benchmarks the global upstream CO2 emissions across the key hydrocarbon producers globally. Additionally, the table also benchmarks the overall hydrocarbon production and the CO2 intensity. The CO2 intensity is further broken down into extraction and flaring intensity.

The US is the highest hydrocarbon producer in the world. They are followed by Russia, who have an almost equal split between oil and gas, like the US. Following on, is the oil dominant Saudi Arabia.

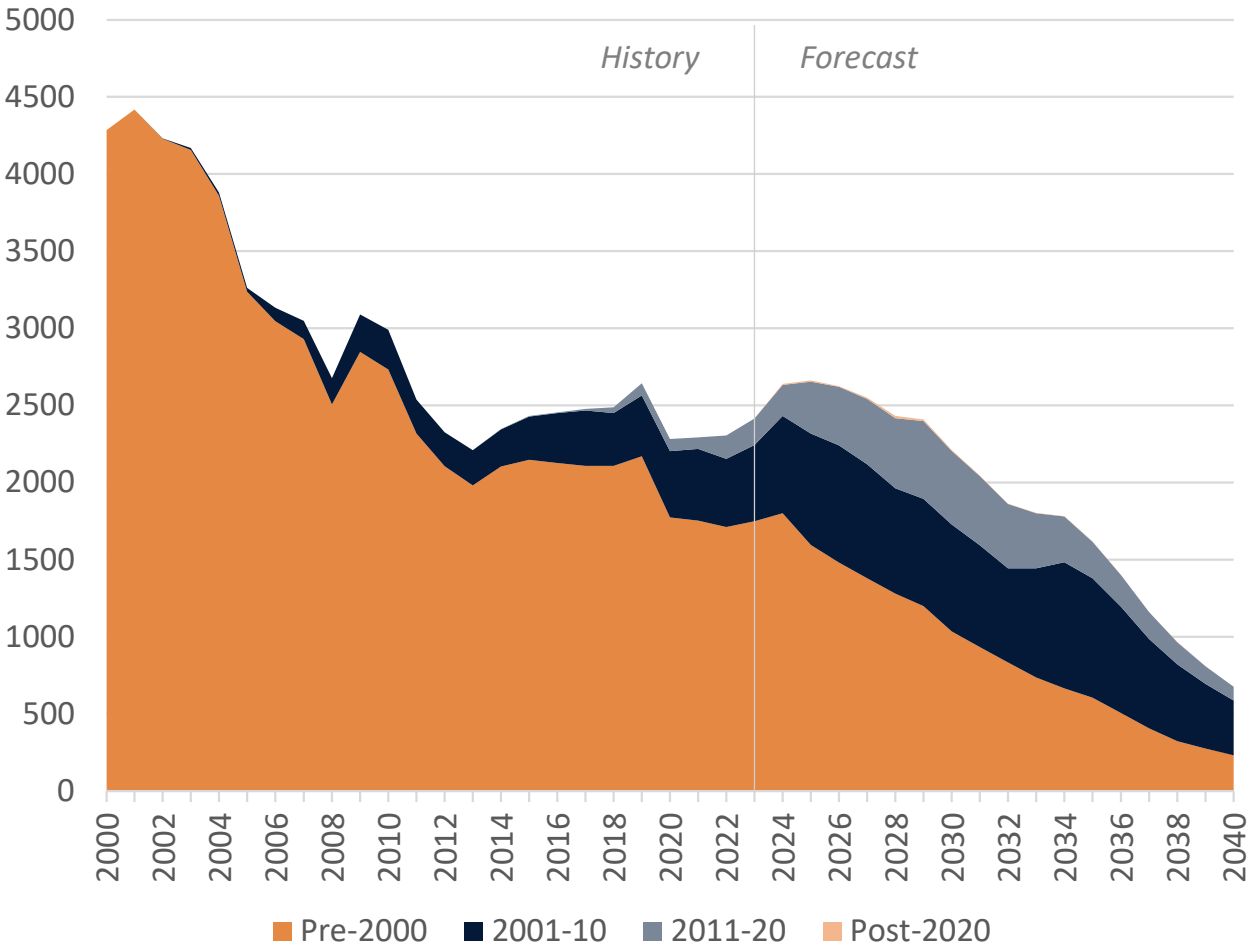
Given the highest production, the US also contributes to the highest emissions globally. However, the production and the overall emissions must be looked at collectively. From an upstream CO2 emission intensity standpoint, the US comes out better than the likes of Russia, Iraq, Canada, Brazil, Nigeria or even Mexico. In countries like Iraq, Mexico, and Nigeria , flaring intensity drives the overall emission intensity, which is quite low in the US.

Furthermore, we have shown the US deepwater separately. In comparison to other deepwater producers like Brazil, the US stands out. From an emissions intensity standpoint, only Norwegian hydrocarbon sector has lower numbers. This adds to the overall competitiveness that the US offshore sector

DW indicates deepwater
Source: Rystad Energy Global Upstream CO2 Emissions

Offshore supply could enter terminal decline if no further leases are awarded

US offshore production by award vintages (thousand barrels of oil equivalent per day)



The chart illustrates the long-term outlook of US offshore supply split across award vintages. US offshore hydrocarbon production in 2023, amounted to 2.40 million boe per day. Off those volumes, around 72% or 1.75 million boe per day came from blocks that were awarded pre-2000. Blocks awarded between 2000-10 accounted for 20% while blocks awarded since accounted for the remaining. As we move towards 2030, production from the oldest vintages would amount to 47% while the remaining would come from the newer vintages, awarded since 2000.

What's important to note is that without those timely awards, production would have struggled to grow and would have remained on a decline trajectory. The previous production growth cycle that came between 2014-16 was driven mainly by the blocks awarded between 2001-10 while the upcoming production uptick will be majorly driven the blocks awarded between 2011-20.

For production to sustain above the 2-2.5 million boe per day mark, new awards and successful discoveries on them would be pivotal. Given the resource potential that remains undiscovered, US offshore production has the potential to sustain, if not growth, provided immediate actions are taken.

Source: Rystad Energy UCube March 2024

Disclaimer

This report has been prepared by Rystad Energy (the "Company"). All materials, content and forms contained in this report are the intellectual property of the Company and may not be copied, reproduced, distributed or displayed without the Company's permission to do so. The information contained in this document is based on the Company's global energy databases and tools, public information, industry reports, and other general research and knowledge held by the Company. The Company does not warrant, either expressly or implied, the accuracy, completeness or timeliness of the information contained in this report. The document is subject to revisions. The Company disclaims any responsibility for content error. The Company is not responsible for any actions taken by the "Recipient" or any third-party based on information contained in this document.

This presentation may contain "forward-looking information", including "future oriented financial information" and "financial outlook", under applicable securities laws (collectively referred to herein as forward-looking statements). Forward-looking statements include, but are not limited to, (i) projected financial performance of the Recipient or other organizations; (ii) the expected development of the Recipient's or other organizations' business, projects and joint ventures; (iii) execution of the Recipient's or other organizations' vision and growth strategy, including future M&A activity and global growth; (iv) sources and availability of third-party financing for the Recipient's or other organizations' projects; (v) completion of the Recipient's or other organizations' projects that are currently underway, under development or otherwise under consideration; (vi) renewal of the Recipient's or other organizations' current customer, supplier and other material agreements; and (vii) future liquidity, working capital, and capital requirements. Forward-looking statements are provided to allow stakeholders the opportunity to understand the Company's beliefs and opinions in respect of the future so that they may use such beliefs and opinions as a factor in their assessment, e.g. when evaluating an investment.

These statements are not guarantees of future performance and undue reliance should not be placed on them. Such forward-looking statements necessarily involve known and unknown risks and uncertainties, which may cause actual performance and financial results in future periods to differ materially from any projections of future performance or result expressed or implied by such forward-looking statements. All forward-looking statements are subject to a number of uncertainties, risks and other sources of influence, many of which are outside the control of the Company and cannot be predicted with any degree of accuracy. In light of the significant uncertainties inherent in such forward-looking statements made in this presentation, the inclusion of such statements should not be regarded as a representation by the Company or any other person that the forward-looking statements will be achieved.

The Company undertakes no obligation to update forward-looking statements if circumstances change, except as required by applicable securities laws. The reader is cautioned not to place undue reliance on forward-looking statements.

Under no circumstances shall the Company, or its affiliates, be liable for any indirect, incidental, consequential, special or exemplary damages arising out of or in connection with access to the information contained in this presentation, whether or not the damages were foreseeable and whether or not the Company was advised of the possibility of such damages.

RystadEnergy

Navigating the future of energy

Rystad Energy is an independent energy consulting services and business intelligence data firm offering global databases, strategic advisory and research products for energy companies and suppliers, investors, investment banks, organizations, and governments.

Headquarters: Rystad Energy, Fjordalléen 16, 0250 Oslo, Norway
Americas +1 (281)-231-2600 · EMEA +47 908 87 700 · Asia Pacific +65 690 93 715
Email: support@rystadenergy.com